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RADIO FREQUENCY ELECTRIC FIELD ATTENUATION MEASUREMENTS FOR SHIELDED EQUIPMENT ENCLOSURES, STANDARD FOR

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FOREWORD

The present design requirements for a space flight vehicle checkout area require that all electrical and electronic systems and components conform to certain limits for electromagnetic interference. Since these limits are considered basic requirements for an electromagnetic compatible checkout complex, electrical and electronic equipment enclosures have become significant with regard to the reduction of electromagnetic interference.

Various types of electronic, electric, and electromechanical equipment used in vehicle checkout areas are, by their very nature, producers of electromagnetic disturbances. The level of these disturbances are, in some cases, of such magnitude as to interfere with the operation of more susceptible equipment. One method of suppressing these disturbances is by placing the interfering source within an enclosure that offers considerable attenuation to the interfering electromagnetic signal.

Interference from a source may be propagated by two modes. These are radiation and conduction. The reduction of interference by the radiation mode is accomplished through the proper use of radio frequency interference enclosures. These enclosures surround the source of radiation, or the unit to be protected from radiation, with a conductive material assembled so that the largest aperture of the enclosure is small when compared with a 1/4-wavelength of the highest frequency of interest.

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RADIO FREQUENCY ELECTRIC FIELD ATTENUATION MEASUREMENTS FOR SHIELDED EQUIPMENT ENCLOSURES, STANDARD FOR

1. SCOPE

1.1 Scope. - This standard establishes the approved method for measuring the radio frequency electric field attenuation of shielded equipment enclosures.

1.1.1 Application. - This standard is concerned only with radio frequency electric field attenuation testing of shielded equipment enclosures. At a later data, a standard will be provided for the magnetic field attenuation testing. Until such time as the magnetic field attenuation test methods are completed and approved, this standard contains the only tests necessary for qualification of equipment enclosures to radio frequency attenuation limits.

2. REFERENCED DOCUMENTS (Not applicable)

3. DEFINITIONS (Not applicable)

4. GENERAL REQUIREMENTS (Not applicable)

5. DETAIL REQUIREMENTS

5.1 Equipment.

5.1.1 Signal sources. - The signal sources shall be powered by dry cell battery packs and shall be capable of covering the frequency range of 0.50 to 1000 megacycles (mc). The power output requirements for the signal source at any one frequency may be determined by the sum of:

(a) The noise level of the receiver in decibels (db).

(b) The transmission path loss in db from the output of the signal source to the receiver input.

(c) The amount of attenuation in db required by the limit specified in figure 1.

The following signal sources, or approved equals, shall be used for performing the electric field tests:

0.50 mc to 65 mc	General Radio Unit Oscillator 1211B
65 mc to 400 mc	General Radio Unit Oscillator 1208B
400 mc to 900 mc	General Radio Unit Oscillator 1209B.
900 mc to 1000 mc	General Radio Unit Oscillator 1218B

5.1.2 Receiver. - The receiver shall be capable of covering the frequency range specified for the signal source and shall meet the following requirements:

(a) The receiver shall have a metered output.

(b) The dynamic input attenuation range shall be such that any input signal may be attenuated by at least 80 db.

The following receiver equipment, or approved equal, shall be used for performing the electric field tests:

Empire Devices Noise and Field Intensity Meter	NF-105
Empire Devices Tuning Unit	T-A/105
Empire Devices Tuning Unit	T-1/105
Empire Devices Tuning Unit	T-2/105
Empire Devices Tuning Unit	T-3/105

5.1.3 Antennas. - The antennas shall be as small as practicable in physical size and shall allow maximum loading of the signal source. The following antennas, or approved equals, shall be used for performing the electric field tests:

Empire Devices Vertical Antenna	VA-105 (2 required)
Empire Devices Dipole Antenna	DM-105-T2 (1 required)
Empire Devices Dipole Antenna	DM-105-T3 (2 required)
Special 1/4-Wave Vertical Antenna	(see figure 2)

5.2 Test procedure. - The attenuation of each enclosure shall be determined at a minimum of two frequencies per octave or seven frequencies per decade or every 50 mc, whichever is less over the frequency range of 0.50 to 1000 mc. The attenuation readings shall be obtained as follows:

NOTE

The attenuation readings obtained can be radically affected by the location of the signal source and its antenna. Since this is especially true when the signal source and antenna are located inside the enclosure, it is imperative that the configurations specified in the following procedure be observed if repeated results are to be obtained.

(a) Select the correct signal source and antennas for the desired frequency range in accordance with table I.

Table I. Test equipment

Frequency	Signal source	Signal source antenna	Receiver antenna
0.50 to 65 mc	General Radio 1211B	Empire VA-105	Empire VA-105
65 to 400 mc	General Radio 1208B	1/4-wave vertical with counterpoise	Vertical half-wave dipole Empire DM-105-T2
400 to 900 mc	General Radio 1209B	Horizontal half-wave dipole Empire DM-105-T3	Horizontal half-wave dipole Empire DM-105-T3
900 to 1000 mc	General Radio 1218B	Horizontal half-wave dipole Empire DM-105-T3	Horizontal half-wave dipole Empire DM-105-T3

(b) Place the signal source and power supply inside the enclosure. There shall be no power leads external to the enclosure.

5.2.1 Attenuation of front of enclosure. - The attenuation readings of the front of the enclosure shall be obtained as follows:

(a) Place the signal source antenna in position A, figure 3 and the receiver antenna in position C, figure 3.

(b) Tune the signal source to the frequency selected within the range of 0.50 to 1000 mc.

(c) Peak the receiver on the frequency of the signal source and record the receiver meter reading.

(d) Move the signal antenna from position A to position B, figure 3 and close the enclosure door (see figure 5).

(e) Peak the receiver again, if necessary, and record the new receiver meter reading.

(f) Record the difference between the first and second receiver meter readings as the attenuation of the front of the enclosure for the frequency of interest.

5.2.2 Attenuation of rear of enclosure. - The attenuation readings of the rear of the enclosure shall be obtained as follows:

(a) Place the signal source antenna in position A, figure 4 and the receiver antenna in position C, figure 4.

(b) Tune the signal source to the frequency selected in 5.2.1.

(c) Peak the receiver on the frequency of the signal source and record the receiver meter reading.

(d) Move the signal antenna from position A to position B, figure 4, and close the enclosure door (see figure 5).

(e) Peak the receiver again, if necessary, and record the new receiver meter reading.

(f) Record the difference between the first and second receiver meter readings as the attenuation of the rear of the enclosure for the frequency of interest.

NOTE

When the attenuation of the enclosure is lower than the limit specified in figure 1 for the frequency of interest, the enclosure shall be probed to locate the points of leakage. The points of leakage shall be noted and recorded with the attenuation data for the enclosure being tested.

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions, should be obtained from the procuring activity or as directed by the contracting officer.)

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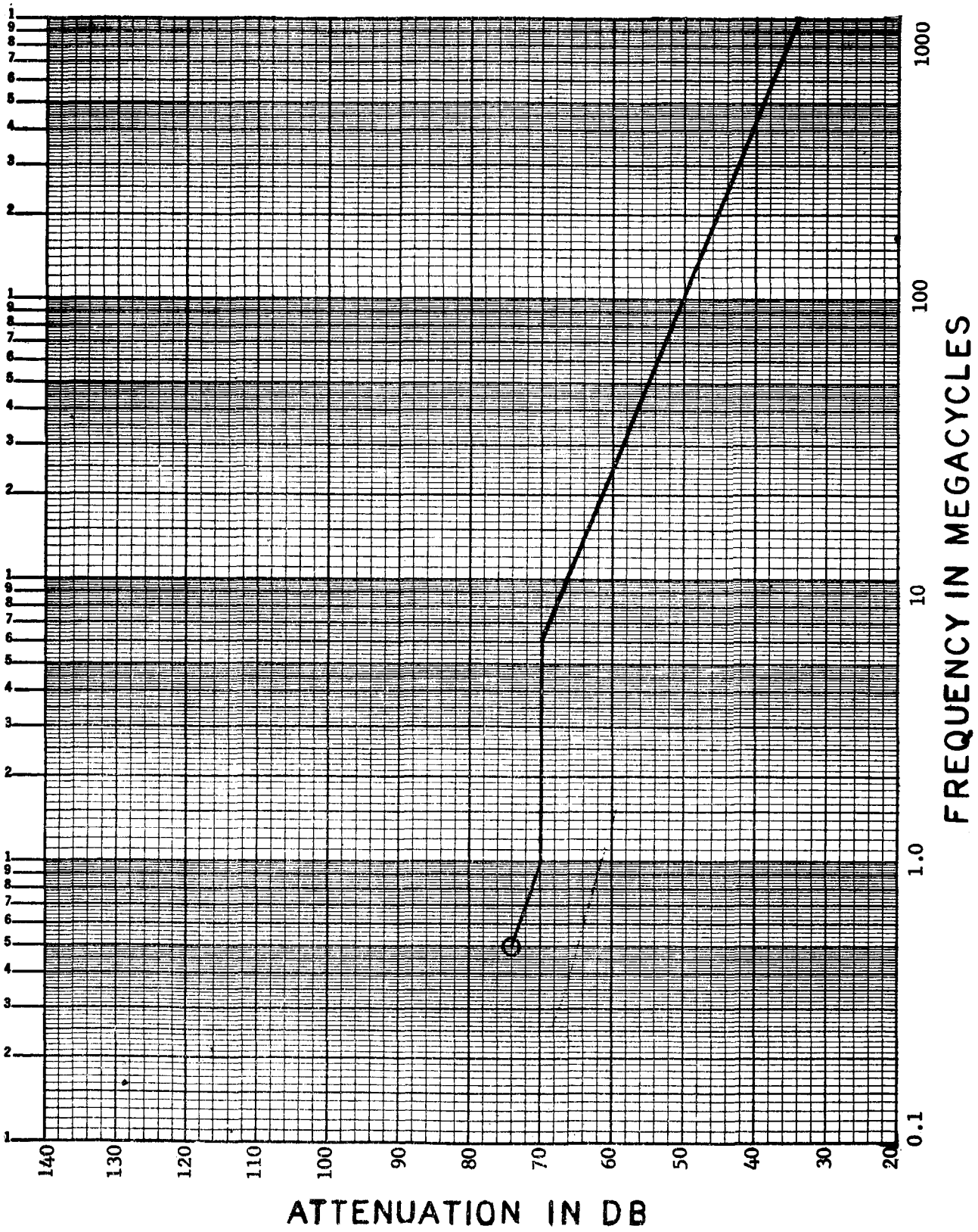

Figure 1. Minimum attenuation limit.

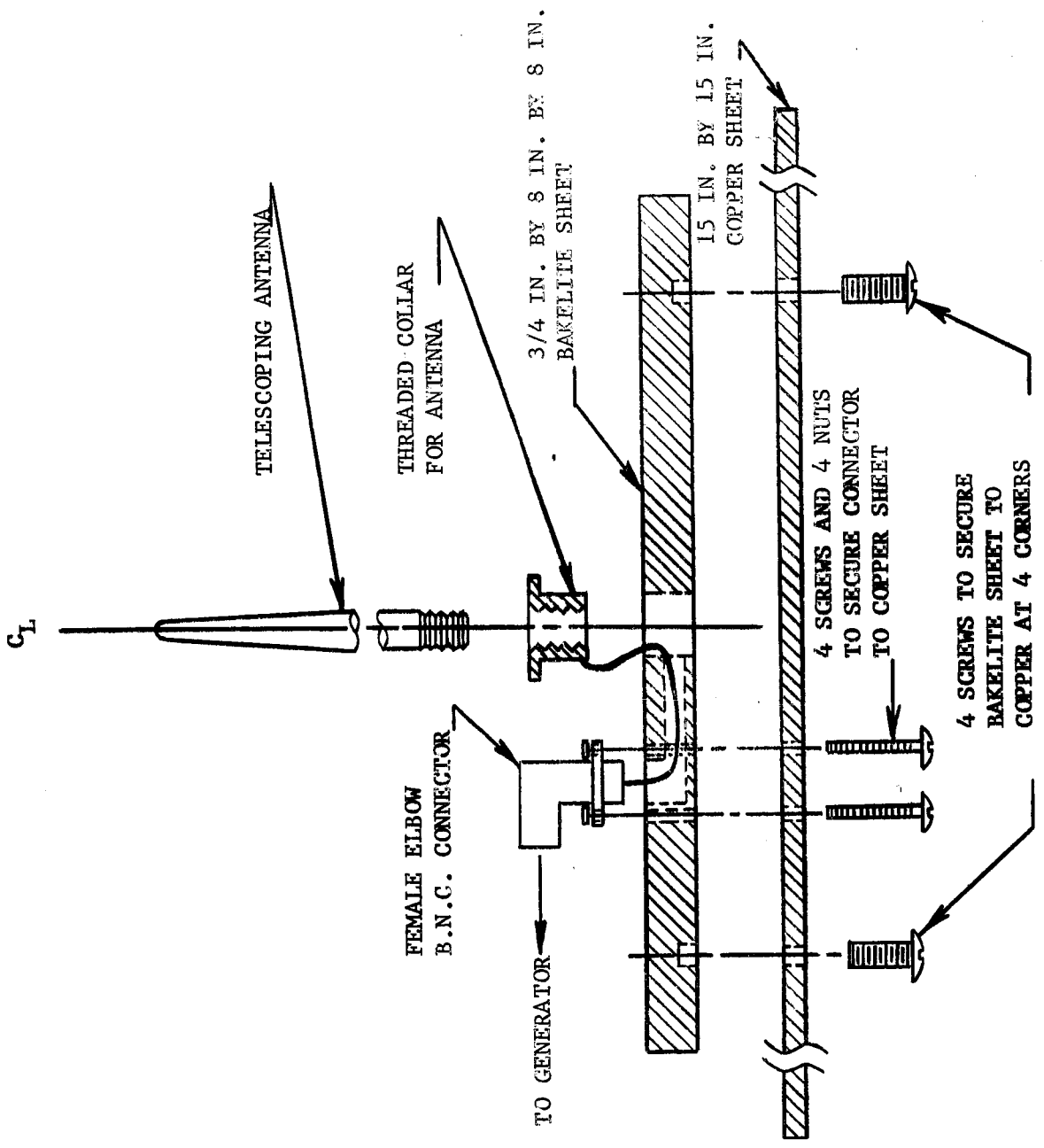

Figure 2. Design details for 1/4-wave vertical antenna.

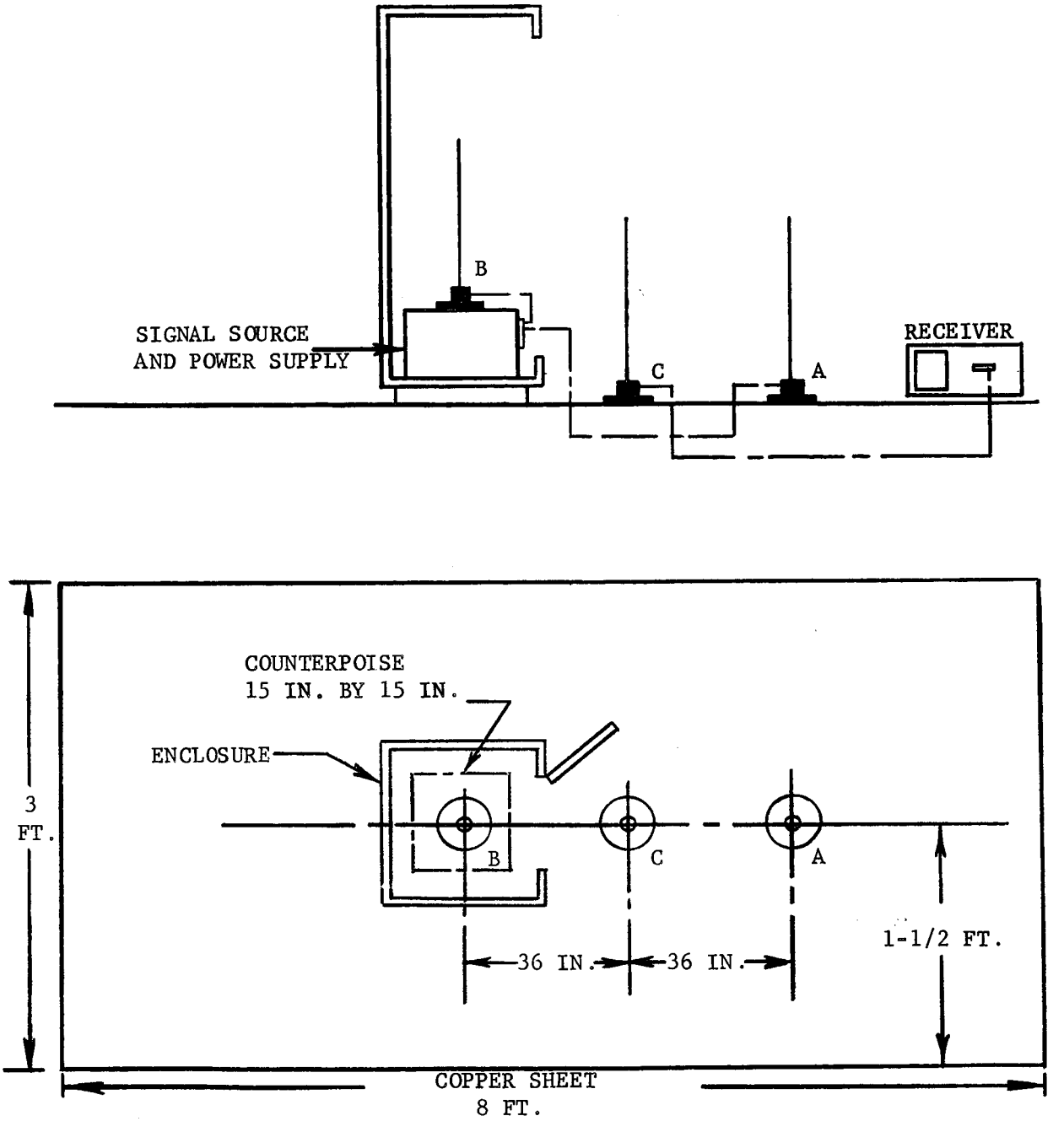

Figure 3. Test configuration for attenuation measurements of front of enclosure.

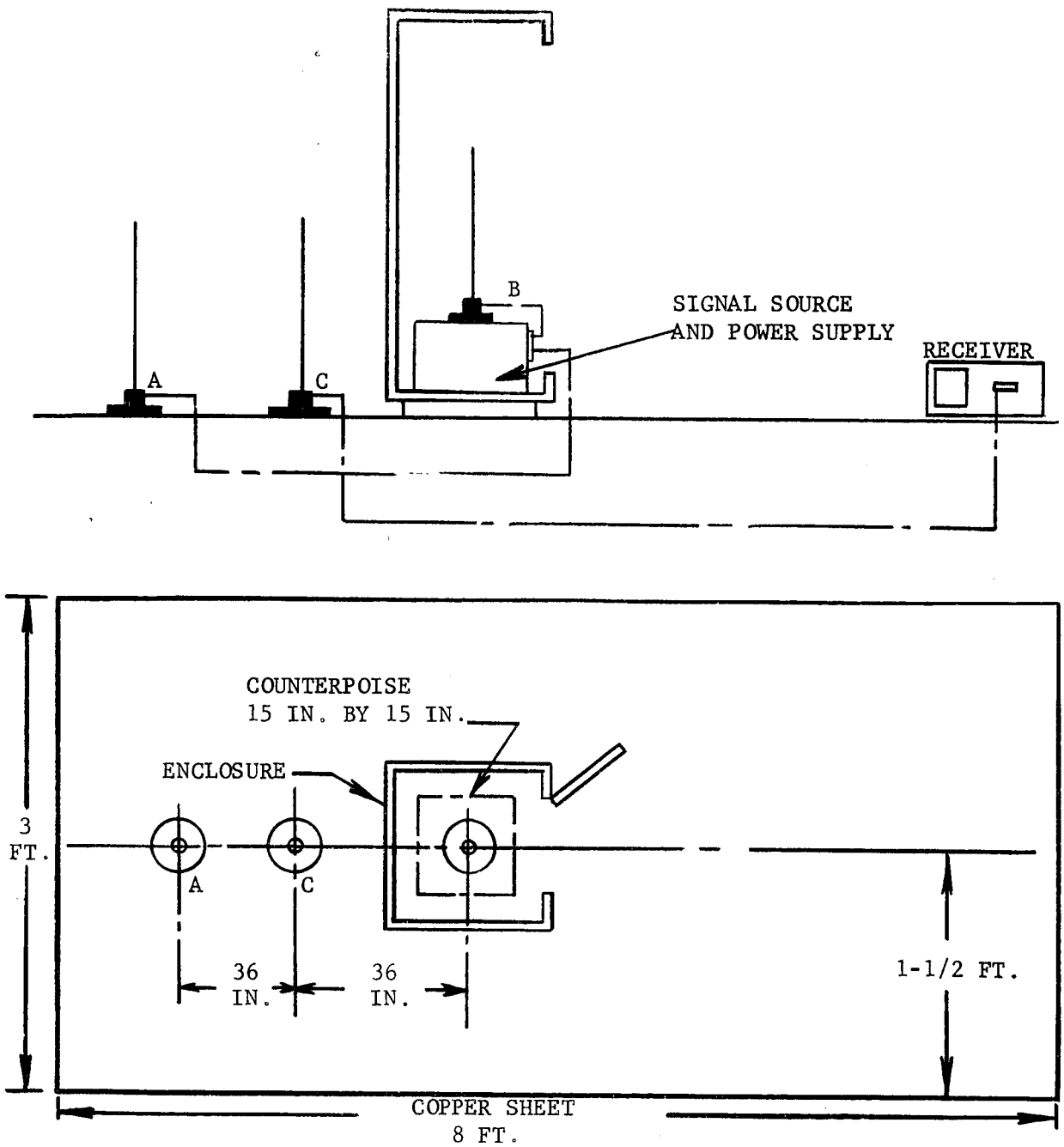

Figure 4. Test configuration for attenuation measurements of rear of enclosure.

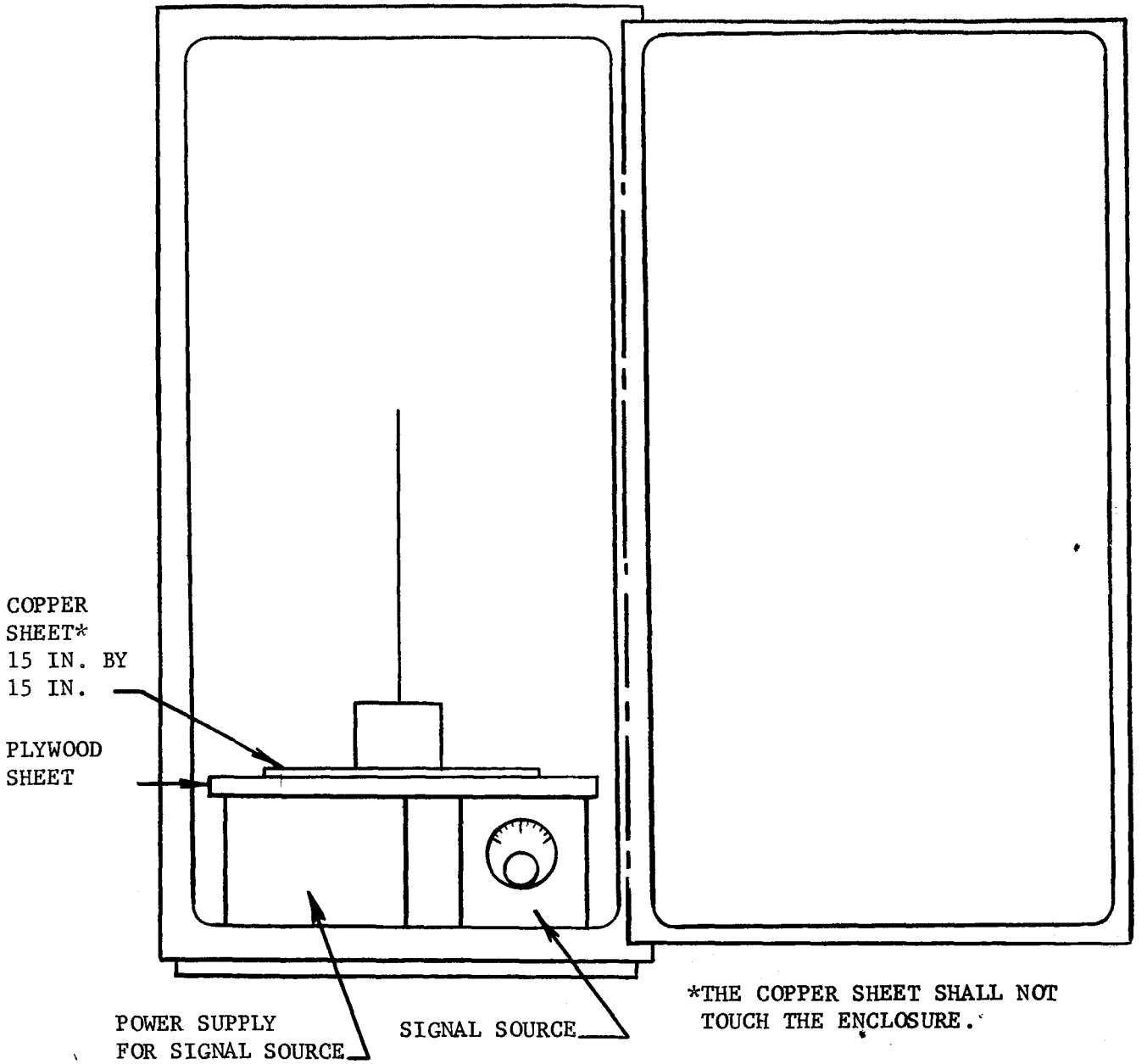

Figure 5. Signal source location.